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Epidermiology, Risk Factor and Treatment of Oral Cancer

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Abstract: ***The neoplastic condition known as oral cancer affects the lips, tongue, buccal mucosa, and upper and lower gums. Assessing oral cancer involves a number of steps and necessitates in-depth understanding of the molecular networks that underlie its growth and progression. The purpose of this study is to present current knowledge regarding the causes, symptoms, and management of oral cancer. In conclusion, oral cancer is a common condition that has serious repercussions for those who are afflicted. A broad To stop this condition from developing and occurring, it is essential to understand pre-malignant lesions, risk factors, and early detection.***
Keywords: Neoplastic,cancer,causes,symptoms,management,oralcancer,conclusion

I. INTRODUCTION

In terms of malignant neoplasia, oral cancer is ninth worldwide, and after cardiovascular disease, it ranks second in terms of mortality, which makes it one of the most prevalent diseases. [1]. It is crucial to understand oral cancer, especially for oral and maxillofacial surgeons. Even though prevention and treatment research is increasing, it remains one of the top 10 cancers.[2] The following are risk factors for oral cancer, a complex disease: immunosuppression, genetic predisposition, diet, chronic inflammation, UV radiation (for lip cancer), cigarette and beverage use, and diseases with the human papillomavirus (HPV) or Candida. In [3] Alcohol and tobacco use are thought to be the main risks for oral cancer development.[4]

II. EPIDERMIOLOGY

The study of epidemiology Since oral cancers are classified as carcinomas of the head and neck (HNC), it is challenging to organize data on their epidemiology. As a result, a lot of research is done on oral cancer as well as cancers of the tonsils, salivary glands, nasopharynx, oropharynx, and other areas. As a result, the data in the review that follows is a compilation of information from publications that look at the epidemiology of head and neck malignancies as well as oral cancer.[5]

Bangladesh, India, Pakistan, and Sri Lanka account for about 25% of newly diagnosed cases of oral cancer, whereas developing countries account for 66% of new cases. In 2004, there were only 15,500 cases of oral cancer identified in Europe, making about 5.5% of all reported cancer cases. The American Cancer Society reported that in 2019, there were 53000 new cases of oral cancer and 10860 deaths from the disease. Arab countries in western and southeast Asia have higher rates of oral cancer.[6]

III. ORAL CANCER RISK FACTOR

Some epithelial malignancies, including pharyngeal and oral neoplasms, are largely caused by chronic inflammation. **[20]**

One of the greatest risk factors for head and neck cancers, such as cancer of the oral cavity and throat, is tobacco use. [7]

Because it is the main cause of cancer, tobacco use remains the most important risk factor for the disease.

Every year, millions of people dying from cancer. Cancers of the lung, oral cavity, pharynx, larynx, esophagus, urinary bladder, renal pelvis, and pancreas are among the neoplastic cancers brought on by smoking. Epidemiological studies have definitively established a link between smoking and cancer in the mouth [8].

Smoking and the use of smokeless tobacco (snuff and chewing tobacco) are both considered forms of tobacco.

- Smoking a pipe increases the chance of developing lip cancer, especially in the region where the lips meet the pipe stem.
- There is a high relationship among smokeless tobacco use and gum, inner cheek, and lip cancer. Exposure to secondhand smoke increases the risk of developing mouth cancer. [9]

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1) Alcohol

There are substances in alcoholic beverages that have been proved to cause cancer in humans. Examples include urethane, mycotoxins, N-nitroso compounds, inorganic arsenic, and others. Acetaldehyde is the main metabolite of alcohol, and it is mostly transformed by the enzyme alcohol dehydrogenase (ADH). Acetate is then produced from
acetaldehyde by aldehyde dehydrogenase (ALDH).

DNA in cultured mammalian cells is harmed by acetaldehyde. It interferes with the synthesis and maintenance of DNA. Sister chromatid swaps and certain gene alterations are also brought on by it. [10]

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2) Human papillomavirus

Most frequently during vaginal, anal, and oral sex, HPV is transmitted by genital contact between skins. If you or your partner have had multiple sexual partners, you are at a higher risk of contracting HPV. Many persons with HPV are asymptomatic and unaware of their infection. When they eliminate it through their own immune responses, they won't know any less. [12]

The main type of HPV that causes cancer of the mouth and oropharynx is HPV 16. The correlation between HPV and oropharyngeal cancers is significantly higher than that of mouth cancers. In the UK, HPV is responsible with over 50 out of 100 (nearly 50%) oropharyngeal cancers. HPV-positive oropharyngeal malignancies have become more common in recent years. Those who have HPV-positive oropharyngeal cancers are typically younger, smoke less, and consume little to no alcohol, in contrast to those who have HPV-negative oropharyngeal cancers.This is contrasted with those who have HPV-negative oropharyngeal cancers. [13]

The risk is four times higher for white, nonsmoking men between the ages of 35 and 55 than for women. The posterior areas (the oropharynx) of the oral/oropharyngeal environment, including the tonsils, tonsillar crypts, tonsillar pillars, the base of the tongue, and the rear of the throat, are where HPV16 most commonly appears. [14]

indicators unique to HPV-positive individuals. Having trouble swallowing is frequently the first indication. Other indicators include: Coughing up blood. ● A bump in your cheek or neck. The hoarseness that persists. The lymph nodes are enlarged. A sore throat. The ears. ● A red or white patch on the tonsils. Jaw edema or discomfort. Inexplicable loss of weight. [14]

3) Diet and nutrition

Diet and nutrition may be important factors in the aetiology of oral carcinogenesis, according to a study on the prevalence of mouth cancer. Vitamins A, E, C, and beta-carotene all have antioxidant properties. They neutralize metabolic products, prevent chromosomal aberrations, limit the activation of pro-carcinogens, and may even prevent the growth of potentially malignant tumors. [15]

Oral cancer: Increased alcohol intake is linked to this condition. -the reduction of consumption of low-antioxidant non-starchy vegetables (vitamins C and E). [16] The consumption of sugar is increased in cases of dental caries. - increase the amount of drinks consumed [16].

Deficits in nutrition have been identified as a risk factor. Plummer-Vinson syndrome-related iron deficiency increases the incidence of esophageal, oropharyngeal, and posterior oral squamous cell carcinoma (Regezi&Scuiba, 1999). ●A diet deficient in fruits and vegetables linked to esophageal, laryngeal, and oral cancers. ●Some studies have connected mouth cancer to diets deficient in vitamin A. [17]

4) The role of inflammation in cancer development

Some epithelial malignancies, including pharyngeal and oral neoplasms, are largely caused by chronic inflammation. [18]During inflammatory phases, immune cells undergo metabolic reprogramming, which includes epigenetic reprogramming, biosynthetic reprogramming, and energy generation reprogramming

The inflammatory processThe primary causes of inflammation are infection, tissue damage, tissue stress, and malfunction; these factors can result in various physiological responses and clinical consequences. Infection or tissue damage sets off the acute inflammatory response, and blood components including leukocytes and plasma are drawn to the infection or injury site.

If the infection cannot be eradicated by the acute inflammatory response, a chronic inflammatory condition results. Chronic inflammation can also result from other types of tissue injury, such as autoimmune reactionsor indegradable foreign substances, in addition to persistently harmful stimuli like infections.

5) Other risk factor

factor An additional risk factor Other possible risk factors for oral cancer include exposure to environmental contaminants including asbestos and heavy metals, poor oral hygiene, and long-term irritation from poorly fitting dentures or sharp teeth. Oral cancer susceptibility may also be influenced by a person's genetic makeup and family history of the disease.

6) Ultraviolet rays

ultraviolet light, or UV light, The potential involvement of oral bacteria, mucosal inflammation, and oral mucosal damage from dental and prosthetic devices in the origin of oral cancer has drawn more attention. Furthermore, there is proof that exposure to UV-B, or actinic ultraviolet radiation, is linked to lip cancer. Mouth cancer risk is further increased by genetic predispositions the outcome in defects in DNA repair pathways, such as xeroderma pigmentosum, Fanconi's anemia, and ataxia-telangiectasia.[24]

IV. TREATMENT

1) Surgery

Surgery for oral and oropharyngeal cancer can occasionally be a major procedure. The area of the mouth or throat that is affected and the amount of tissue that must be removed will determine this. You will therefore stay unconscious for the duration of the procedure. The malignancy and the surrounding healthy tissue are removed by your surgeon. The lab receives a sample of the margin—the tissue that surrounds the malignancy. To find cancerous cells, a pathologist examines the cells under a microscope. It is referred to be a clear margin if there are no cancer cells. [19]

Chemotherapy kills cancer cells by using anti-cancer (cytotoxic) medications. Cisplatin and fluorouracil (5FU) are common chemotherapy medications for cancers of the mouth and oropharynx. The majority of chemotherapy medications for oropharyngeal and oral cancer are administered intravenously to your circulation. Adverse consequences If you are receiving chemotherapy together with radiation therapy, your side effects may differ from those listed here. [20] Typical adverse effects of chemotherapy include: feeling ill appetiteloss reducing body weight feeling extremely worn out higher chance of contracting an illness

2) Radiation

One kind of cancer treatment is radiation therapy, sometimes referred to as radiotherapy. Radiation techniques used now are accurate. They shield healthy tissues from severe radiation dosages while directing beams straight at the malignancy. Radiation therapy destroys the genetic material of cells, causing harm. Cell division and growth are governed by genetic material. Radiation therapy has the potential to harm both cancerous and healthy cells. However, cancer cells are more difficult to mend than healthy cells. Radiation therapy aims to treat the cancer while causing the least amount of damage to healthy cells. [20]

For more than a century, radiation therapy has been a dependable and successful cancer treatment. Radiation therapy can kill cancer cells and improve the effectiveness of other therapies, depending on the type of cancer you have. It plays a significant role in palliative care as well. It can help you live a longer, more satisfying life by reducing the symptoms of cancer. [21]

3) Chemotherapy

One promising strategy to stop, reduce, or manage carcinogenesis is chemoprevention. Patients with postoperative oral cancer and leukoplakia are the ideal candidates for chemoprevention in relation to oral lesions. [22] Strong antioxidants including vitamin C, E, and carotenoids, as well as polyphenols, are examples of natural items that can prevent oral cancer. [22] Green tea extract, vitamin A, isotretinoin (13-cis retinoic acid), and certain medicinal plants have all been employed as chemopreventive drugs. [23]

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4) Diagnosis

a) Biopsy:

- *Tissue biopsy:* The only method to determine whether or not oral cavity or oropharyngeal cancer is present is to surgically remove a tissue sample from the suspected area and send it to a pathological laboratory for a detailed microscopic examination . For a biopsy, careful tissue handling is essential for a confident histological diagnosis; if the sample is handled carelessly, the biopsy may be defective and the procedure must be repeated. Biopsies such as exfoliative cytology and incisional biopsy are performed depending on the particular need.
- *Liquid biopsy:* A tissue biopsy is a method for removing soft tissues from the mouth cavity or lymph nodes using surgery or specialized instruments. Traditional tissue biopsy is the most accurate way to diagnose oral cancer. A variety of tissue biopsy procedures are available, such as needle aspiration, punch, brush, surgical, and lymph node. These methods are performed with a range of tools, such as a scalpel, circular blade, hollow needle, and others. A tissue biopsy is a procedure where a small sample of body tissue is removed for microscopic examination. Its primary use is in the diagnosis of diseases such as inflammatory disorders, infections, and cancer.[25]
- *Brush biopsy:* A non-invasive diagnostic procedure called liquid biopsy looks for cancer-related substances such circulating tumor DNA (ctDNA), circulating tumor cells (CTCs), RNA, exosomes, and proteins by evaluating a sample of body fluid, usually blood.As mentioned earlier, the main components of liquid biopsy indicators are CTCs, ctDNA, exosomes, free miRNA, lncRNA, circRNA, proteins, and so on. These components are detected in different ways, but they all have certain characteristics in common. CTCs must be enriched in order to be detected, and they are then labeled with specific fluorescent dyes or antibodies. Under a microscope, these markers can produce visible fluorescence signals by binding to particular antigens on the surface of circulating tumor cells. The two most popular techniques for enriching CTCs are physical separation and antigen-antibody conjugation. Cells are separated using conventional physical separation techniques according to screening criteria like cell size, density, or charge. The CellSearch system mainly uses traditional antigen-antibody binding techniques to identify CTCs. It is based on the idea that EpCAM traps tumor cells.[25]

b) Physical examination:

Many studies have been conducted on oral brush biopsies. The sensitivity and specificity of brush biopsy have been the subject of numerous investigations at specialized tumor centers and university hospitals [3–7, 15–30]. The effectiveness of vital staining, light-based detection, and oral cytology was investigated in the most recent Cochrane Library meta analysis on diagnostic techniques for mouth cancer and potentially malignant disorders. To get cells from the oral mucosa, the majority of them employed oral brush biopsies. The Cochrane study's authors contend in the discussion that normal dental procedures cannot directly benefit from the encouraging results of oral cytology, which include a combined sensitivity of 90% and a combined specificity of 94%.[26]
A thorough examination and palpation of the mouth cavity and surrounding structures are part of the physical examination used to detect oral cancer. Palpation and careful ocular examination are the two steps that are typically included. An internal examination of the buccal cavity comes after the exterior components—such as the lips, salivary glands, lymph nodes, etc.—have been examined. Edema, fluctuation, and anomalies and abnormalities in the superficial anatomy are among them. Soreness, lumps, soft tissue thickening, problems with jaw movement, difficulty swallowing and chewing, ear ache, etc. are common findings.[24]

- *CT scan :* Therefore, contrast enhanced multidetector CT (MDCT) is the suggested imaging method. In contrast to MRI's high sensitivity (96–97%) and negative predictive value, MDCT provides a very high specificity (87–90%) for identifying bone involvement. However, because of its limited specificity for cortical invasion (54%), MRI is a poor imaging method for evaluating these cancers. Since the structures of the oral vestibule are usually opposed, which limits the investigation, the puff cheek approach is the most efficient method for performing MDCT. Dental amalgam produces artifacts in MRI and CT scans, but not in CT gantry re-angulation or the open mouth approach.[26]

The following features must be assessed on CT or MRI:

- Soft tissue extent: High vs Low ITF
- Bone involvement
- Perineural involvement
- Radiological ENE

- *MRI:* Contrast enhanced MRI (CE-MRI) is a helpful imaging method for suspected perineural spread on the brain and its cerebral extension beyond the foramen. T1W MRI provides a good contrast for darker tumors inside the bone marrow area. CEMR helps in the early detection of perineural dispersion because excessive enhancement is caused by a break in the blood-nerve barrier that occurs before nerve extension. Nemzek et al. demonstrated a 95% MRI susceptibility for perineural spread detection, while Imaizumi et al. demonstrated that MRI understates inferior alveolar tract invasion due to surrounding inflammation.[26]

V. CONCLUSION

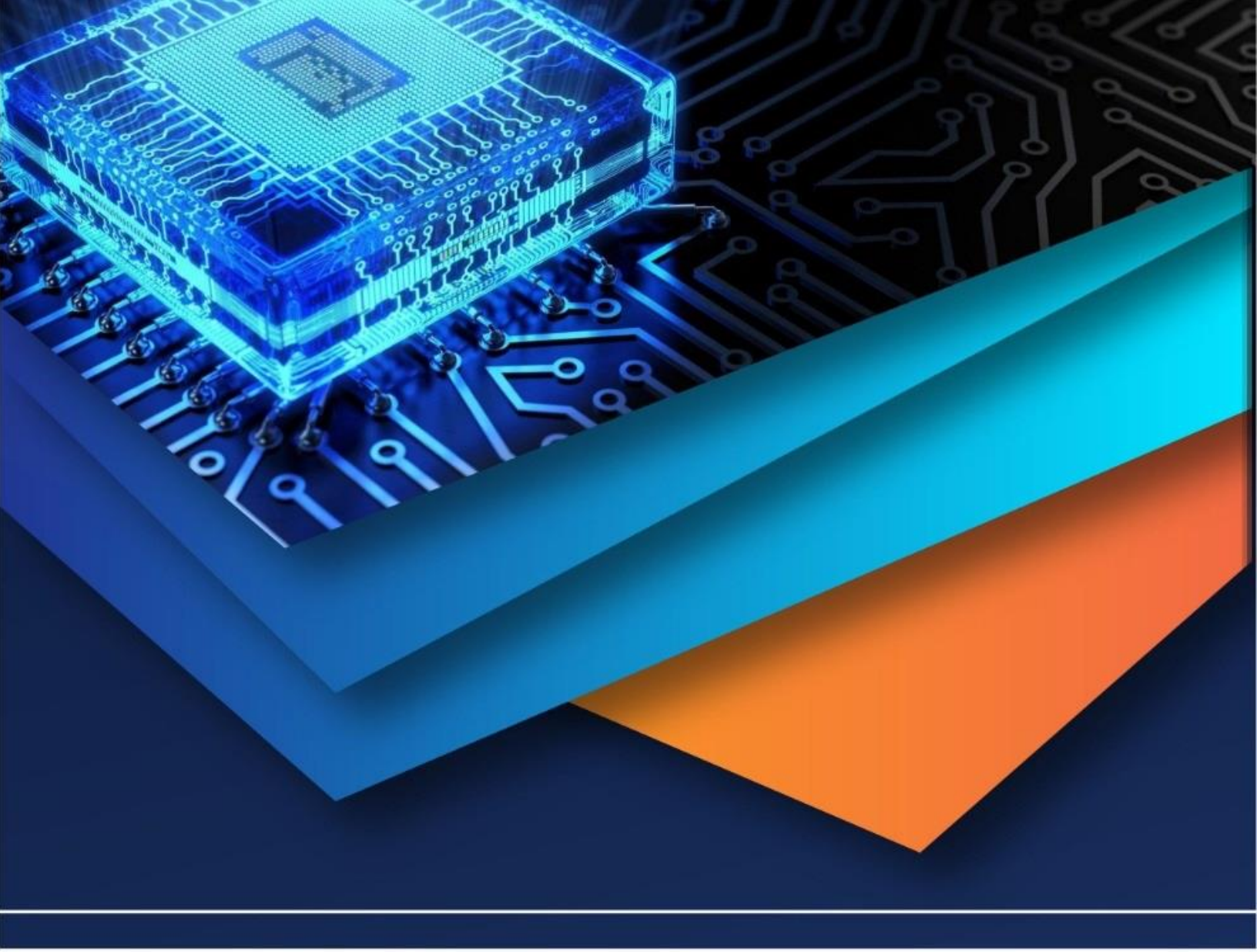
Due to the high morbidity and mortality rates of oral cancer, more effective strategies and treatment plans are required. Surgery is the primary treatment strategy for patients with oral cancer, with radiotherapy and chemotherapy reserved for patients who cannot tolerate surgery. This study also shows epidemiology, risk factors, and treatment on oral cancer. There are a number of risk factors that may be involved in the development of oral cancer, with tobacco smoking, alcohol consumption, and HPV being the most studied risk factors. In addition, inflammation and genetic susceptibility are thought to play a crucial role.

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